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Cognitive Impairments in Abstinent Alcoholics

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Impaired cognitive functioning in alcoholics is widespread during the first months of detoxification. Between half and two thirds of abstinent alcoholics exhibit cognitive impairments during this period, with residual deficits persisting for years after detoxification in some patients. The most severe deficits have been observed in visuospatial abilities, perceptual-motor integration, abstract reasoning, and new learning. The most significant predictors of cognitive dysfunction in persons recovering from alcoholism are the time elapsed since the last drink and the person's age. Surprisingly, the pattern and duration of a patient's alcohol abuse are relatively weak determinants of neuropsychological impairment during abstinence. Research investigating the hypothesis that cognitive impairments may be related to alcoholic persons resuming drinking has yielded mixed results, but a higher level of neuropsychological functioning is associated with increased rates of completing treatment programs and with greater success in the work environment after discharge from treatment. The possibility of cognitive limitations should be taken into account in planning treatment programs for alcoholism.

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The deleterious effects of alcohol on cognitive functioning were reported as early as the 1880s separately by Wernicke[1] and by Korsakoff,[2] followed by Hamilton,[3] Fisher,[4] and Wechsler.[5] The studies of Fitzhugh and coworkers, introducing the clinical neuropsychological model to the study of cognitive function in alcoholism, marked the beginning of systematic research in this area.[6,7] The current literature reflects developing understanding of both the time course of the recovery of cognitive functions during abstinence and the multiple factors that may influence the presence and severity of cognitive deficits in specific patients.

Cognitive deficits in abstinent alcoholics have been identified in both men and women[8,9] and in members of different races[10] and nationalities, including Americans,[8] Canadians,[11] Danes,[12] Norwegians,[13] Scots,[14] and Swedes.[15] The deficits are widespread during the first months of abstinence, with between half and two thirds of abstinent alcoholic persons exhibiting cognitive impairments after acute detoxification.[16,17] Although the percentage of abstinent alcoholics with cognitive impairments has been reported in various study samples, there have been no large-scale epidemiologic studies establishing the prevalence of such deficits in the alcoholic population. Most studies have used convenience samples from inpatient or outpatient treatment settings; such samples are biased by the selection of patients who have sought treatment. Nonetheless, the available data illustrate the tremendous extent to which neuropsychological problems are exhibited among alcoholic patients in treatment.

Although many cognitive deficits are reversible during sustained abstinence, residual deficits persist in some patients for extended periods of time. The deficits may adversely affect patients' ability to profit from some treatment interventions and may also exert a significant effect on their lives outside of treatment. The presence and severity of cognitive impairment should inform the choice and timing of various treatment strategies. It is important to note both that not all persons with alcoholism suffer from cognitive impairments and that some deficits are unlikely to be elicited in a standard medical evaluation and may be missed unless specifically assessed.

Cognitive Impairments as a Function of Duration of Abstinence

The most significant determinant of the presence of cognitive deficits in persons recovering from alcoholism is the time elapsed since their last drink. When this time period is controlled for, different patterns of deficits emerge for each of three time periods:

- The acute detoxification period, which lasts as long as the first two weeks of abstinence;
- The intermediate-term abstinence period, which begins after detoxification and extends through the first two months of abstinence; and
- The long-term abstinence period, which extends from two months to five years of abstinence.

The general pattern of deficits in these three time periods is displayed in Table 1.

Acute Detoxification (Up to 2 Weeks' Abstinence)

Alcohol use has well-documented deleterious effects on attention, concentration, reaction time, motor coordination,

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TABLE 1.—*Cognitive Deficits as a Function of Duration of Abstinence*

Cognitive Deficit	Acute Detox Period	Intermediate-term Abstinence	Long-term Abstinence
Distractibility	Yes	...	...
Mild confusion	Yes	...	...
Irritability	Yes	...	...
Attention and concentration	Yes	Yes	...
Reaction time	Yes	Yes	...
Verbal learning ability	Yes	Yes	...
Verbal abstract reasoning	Yes	Yes	...
Verbal short-term memory	Yes	Yes	...
Nonverbal abstract reasoning	Yes	Yes	Yes
Visuospatial abilities	Yes	Yes	Yes
Mental flexibility	Yes	Yes	Yes
Nonverbal short-term memory	Yes	Yes	Yes

Detox=detoxication

motor speed, judgment, problem-solving, learning, and short-term memory.[18-25] These effects are apparent in nonalcoholic persons as well as in alcoholics. In addition to the direct effects of alcohol on cognitive functioning, the common physiologic symptoms of detoxification, such as tremulousness, irritability, agitation, and sleep disturbance, may interfere with an alcoholic patient's test performance by reducing motivation and effort. Because these severe and pervasive impairments abate substantially with detoxification, neuropsychological assessment during this initial period is of little value. Rather, it is the residual deficits in patients following detoxification that are relevant to the diagnosis of cognitive impairment and that have implications for treatment planning.

Intermediate-term (2 Weeks' to 2 Months') Abstinence

After detoxification, abstinent alcoholics' overall intellectual functioning, as measured by composite IQ test scores, falls within the normal range. The composite IQ score reflects both overlearned verbal skills (crystallized intelligence) and more novel visuospatial and problem-solving skills (fluid intelligence). The crystallized intelligence of the overlearned verbal skills is intact after the detoxification period, whereas fluid intelligence skills are impaired in many patients. Because a patient's responses within a standard medical interview primarily reflect intact crystallized intelligence, the interviewing physician may get the mistaken impression that a patient's cognitive functioning is intact.

Impairments in fluid-intelligence skills of visuospatial processing and problem solving persist during the intermediate-term abstinence period in most recovering alcoholics, as evidenced by lower Performance IQ subtest scores relative to Verbal IQ subtest scores.[7,13,26,27] Recovering alcoholics also show impairments on other visuospatial and constructional tasks involving visual scanning,[28] visuomotor speed and coordination,[6,13,29,30] and disembedding figures from a complex design.[31-33] These performance deficits on complex visuospatial and constructional tasks appear to reflect impairments in higher cognitive functions of perceptual analysis and synthesis, insofar as visuosensory functioning is intact in this population.[11,34,35]

The presence, however, of motor deficits can also confound the picture of neuropsychological deficits, insofar as motor slowing, for example, can reduce performance on tests of visuomotor abilities. Tarter and Jones examined the motor functioning of abstinent alcoholics two and eight weeks after detoxification.[23] At two weeks, all patients performed significantly worse than controls on motor speed, muscle strength, and visuomotor coordination. At eight weeks, the findings were more complicated: whereas abstinent alcoholics with drinking histories of greater than ten years were still impaired on motor functioning, those who had been drinking for a shorter period performed as well as the controls. The authors concluded that motor functioning does become impaired after chronic alcohol abuse and that the shorter the period of abuse, the greater the potential for recovery with abstinence. This result implies that impaired motor functioning contributes to the pattern of neuropsychological deficits only in patients with long histories of alcohol abuse.

As indicated earlier, intermediate-term abstinent alcoholics also perform more poorly than nonalcoholic persons on tests of problem-solving and abstracting abilities. These impairments have been observed in interpreting proverbs, forming hypotheses, developing problem-solving strategies, and using feedback to monitor and correct one's responses. While some studies have failed to find deficits in verbal abstract reasoning,[7] the tests used in these studies generally involved familiar and overlearned concepts. When more challenging tests of verbal analogic reasoning are used, abstinent alcoholics do perform substantially more poorly than controls.[36,37]

One of the most sensitive tests of the impaired abstraction abilities of abstinent alcoholics is the Categories subtest of the Halstead-Reitan battery. In this test, the subject uses the pattern of examiner feedback as the basis for modifying responses to subsequent stimuli. The test requires the subject to generate alternative principles for responses, to hold in working memory the feedback to a number of responses, and to be flexible in applying alternative response patterns until he or she determines the correct one. Results from a large number of studies indicate that about 75% of intermediate-term abstinent alcoholics perform in the impaired range on this test.[13,25-27,30,38-41] The majority of this population also evidences deficits on the Tactual Performance Test, a complex spatial problem-solving task that involves inserting forms in a form board while blindfolded, and the Trail Making Test, part B, a connect-the-dots task that involves alternating between a numeric and an alphabetic series and apparently assesses cognitive flexibility.[42]

Impairments in memory and learning in abstinent alcoholics have been reported less frequently but are now receiving increasing attention. Tarter and Edwards report that learning and memory deficits were not observed when standard clinical tests were employed but were elicited by more challenging laboratory tasks.[43] Other investigators have reported short-term-memory impairments and learning deficits in both verbal and nonverbal tasks,[44-48] and studies on the reversibility of cognitive deficits reveal that scores on short-term-memory tasks improve relative to the length of abstinence.[18-20] Rather than using semantic strategies on verbal learning tasks, alcoholic patients tend to use rote learning,[49] which is a far less efficient method. Butters and Brandt have also shown retrograde memory impairments in alcoholism.[50] Overall, impairments in memory are not as conspicuous as are those in visuospatial, abstraction, and problem-solving abilities. In this regard, in a study that directly compared rates of recovery of verbal versus visuospatial

learning abilities during alcohol abstinence, visuospatial learning abilities were found to recover more slowly.[51]

The ability to learn new verbal material, which is impaired during the detoxification period, has been shown both to recover within the first two weeks of abstinence[52] and to remain impaired after a month.[20,49] This discrepancy of results may be due to the greater difficulty of the verbal learning tasks used in the studies of Weingartner and associates and Ryan.[20,49] In this regard, Weingartner and colleagues found that whereas abstinent alcoholics were equivalent to nonalcoholic controls in their ability to remember a list of words after a single presentation, with repeated trials, the alcoholic patients learned fewer additional words than did the controls.[20] Ryan also showed that abstinent alcoholics took substantially longer than controls to learn a word list,[49] but when he provided the abstinent alcoholics with mnemonic strategies for learning and remembering the words, they did as well as the control groups. These studies indicate that recovering alcoholics do show verbal learning deficits, but that these deficits are more subtle than are the deficits exhibited on visuospatial and problem-solving tasks. The results also suggest that recovering alcoholics have particular difficulty in generating effective strategies for remembering. This difficulty may be related to their problems in organizing performance on complex new tasks.

Long-term Abstinence (Greater Than 2 Months)

It may take several years before an abstinent alcoholic achieves full recovery of cognitive functioning in the areas of abstract reasoning, visuospatial ability, short-term memory, and mental flexibility. Moreover, a patient's age and the occurrence of interim drinking are important variables that influence the extent of the recovery of cognitive function over time. Grant and co-workers have suggested using either "intermediate-duration organic mental disorder" or "subacute organic mental disorder" to characterize the slow recovery process associated with prolonged abstinence.[32,53]

Leber and associates examined learning and memory in two groups of alcoholics abstinent for 3 and 11 weeks, respectively, and in a matched control group.[54] No differences among the three groups were observed in verbal-learning abilities; however, on a visuospatial learning task and on memory for designs, the short-term-abstinent alcoholics performed more poorly than the long-term-abstinent alcoholics, who performed more poorly than the controls. On the memory for designs task, 38% of the short-term-abstinent alcoholics were impaired compared with only 19% of the long-term-abstinent alcoholics. In a later study of visuospatial memory, Fabian and Parsons found similar results, with long-term-abstinent alcoholics performing at a level between those who were abstinent for a short term and controls.[55] Ryan and colleagues also compared short-term-abstinent alcoholics, long-term-abstinent alcoholics, and controls on a test of digit-symbol substitution.[56] They found that alcoholics performed worse than controls, with a trend, not reaching statistical significance, for long-term-abstinent alcoholics to perform better than those abstinent for a short time. Brandt and co-workers also studied prolonged-abstinent alcoholics (minimum of five years of abstinence), who they found to perform at levels indistinguishable from those of controls.[46]

Yohman and associates studied alcoholics and matched controls in a longitudinal study, with testing at 7 weeks after detoxification and again 13 months later.[57] At the initial testing, the alcoholics performed as well as the controls in learning and memory abilities but did more poorly on verbal abilities, abstracting and problem-solving skills, and perceptual-motor abilities. In their analysis of the 13-month data, they separated those alcoholics who had maintained abstinence during the 13 months from those who had resumed drinking (albeit at a reduced level). They found that the abstainers had improved in learning, memory, abstracting and problem-solving, and verbal abilities, whereas the intermittent resumers had improved only in verbal abilities. Further, even the abstainers still performed significantly worse than controls on perceptual-motor tasks 13 months after initial testing. These results show that alcoholics who resume drinking, even at a reduced level, do not achieve the same gains in cognitive function as their abstinent peers and that even abstinent alcoholics do not fully recover their cognitive abilities after 13 months.

Goldman and colleagues examined the effect of age on the recovery of visuospatial impairments in abstinent alcoholics.[58] They studied three age groups: those younger than 30 years, a group 31 to 40 years old, and those older than 40 years, and two control groups: college-aged students and army volunteers older than 40, administering 14 tests over a three-month period. At the initial testing a week after detoxification, all alcoholic groups were impaired relative to the control groups, and the oldest alcoholics were more impaired than were the two younger alcoholic groups. At three months, the two younger alcoholic groups had improved to the level of the control groups, whereas the oldest alcoholics continued to show impairment on most of the measures. Moreover, because the recovery of cognitive capacity was not found to be associated with the quantity or frequency of drinking, it was concluded that age itself was the critical variable in the failure to recover these aspects of cognitive functioning.

Finally, some cognitive changes may not be reversible even in younger abstinent alcoholics. Brandt and co-workers studied younger (mean age 42.2 years) and older (mean age 55.1 years) abstinent alcoholics after seven years of abstinence.[46] While short-term memory and psychomotor performance had returned to normal levels, deficits did persist, even in the younger group, in the learning of new verbal associations. This study suggests that some of the cognitive impairments associated with severe alcoholism may be permanent, even in relatively young alcoholic persons.

Mediating Factors

Although the general pattern of neuropsychological impairments in abstinent alcoholics is well established, the cause of these impairments involves a mixture of biologic and environmental factors that are, as yet, poorly understood. Environmental factors include the direct or indirect neurotoxic effects of alcohol, which may be affected by the duration of alcoholism and the drinking practices—that is, binge drinking versus daily drinking; poor nutrition; a history of concomitant abuse of other drugs with central nervous system toxicity; and a history of head injury (fights, falls, and accidents). The primary biologic factors include age, preexisting neuropsychological impairments that might be related to a genetic predisposition to alcoholism, and a concomitant psychopathologic disorder. Further, structural brain changes, such as cortical atrophy, have been suggested as a possible substrate underlying cognitive deterioration. Re-

search to date has shown that a patient's age is the most potent predictor of alcohol-related cognitive dysfunction. Surprisingly, drinking practice and duration are relatively weak predictors of neuropsychological impairment in abstinent alcoholics. Most researchers have excluded from study patients with a notable abuse of other drugs, concomitant psychopathology, or with histories of substantial head trauma, so that the relative contribution of those variables to neuropsychological morbidity has not been evaluated. Similarly, although it is well documented that specific nutritional deficiencies can directly cause neuropsychological impairments, such as the syndromes described by Wernicke and by Korsakoff, nutritional status per se has not been evaluated in terms of its contribution to neuropsychological morbidity.

Age and Cognitive Deficits in Alcoholic Patients

A number of studies have shown that cognitive deficits are much more prevalent among older than younger alcoholics. While this might be because the aging brain is more susceptible to the toxic effects of alcohol use, studies showing cognitive deficits even among young alcoholics have led to the suggestion that alcoholism leads to "premature aging" of the brain. Ryan and Butters, for instance, showed that the performance of alcoholics on some sensitive tests of learning and memory resembled that of nonalcoholic controls approximately ten years older.[44] On the other hand, there is evidence that at least some of the alcohol-related deficits are distinguishable from those associated with normal aging—that is, that alcohol induces an "independent decrement" in cognitive decline.[59] For instance, while word-retrieval deficits and psychomotor slowing are common among the elderly, these do not typically occur in middle-aged alcoholic samples. Conversely, older alcoholics seem to have trouble with aspects of nonverbal learning that are spared among nonalcoholic elderly.[60] Whichever hypothesis accounts for the phenomenon, the overarching and clinically relevant finding in this area is that the aging process does complicate the cognitive status of alcoholics, such that they become, as they age, increasingly at risk for cognitive impairment.

From another perspective, Portnoff found that alcoholics who began drinking at a mean age of 14 years showed more severe cognitive impairments than did alcoholics who started drinking at a mean age of 23 years, even though the number of years of heavy drinking did not differ between the two groups.[61] These results suggest that alcoholics who began drinking in their teens may be particularly vulnerable to the neuropsychological morbidity of alcohol abuse.

Biologic Trait Variables

There is overwhelming evidence that genetic factors predispose children of alcoholics towards alcoholism.[11,34,62-64] Children of alcoholics also exhibit a distinctive pattern on electroencephalograms and cortical evoked-potential testing,[65-68] consistent with a genetically determined trait manifesting itself in altered brain function. Tarter and colleagues reported that although their overall IQs were indistinguishable from the offspring of nonalcoholics, the sons of alcoholics performed worse on tests of educational achievement.[69,70] Schaeffer and associates also found evidence of neuropsychological impairment in relatives of alcoholics compared with those of nonalcoholic persons.[71] Additionally, many alcoholics were hyperactive as children,[72-75] and hyperactivity is associated with attentional and learning difficulties. De Obaldia and Parsons found that alcoholics with evidence of childhood hyperactivity performed worse on neuropsychological testing than did alcoholics without evidence of childhood hyperactivity.[76] Although the results regarding neuropsychological and achievement deficits in children of alcoholics may reflect a mixture of biologic and environmental factors, they are consistent with the conjecture that genetic factors may partially mediate the neuropsychological morbidity of alcohol abuse.

Structural Brain Changes of Alcoholism

Structural brain changes of alcoholism were first observed on postmortem examinations[77] and using pneumoencephalography.[78] With the introduction of computed tomography and magnetic resonance imaging, these observations have been replicated by numerous investigators.[32,79-85] Widened sulci have been found consistently in patients of all ages with chronic alcoholism. This widening is particularly apparent in the frontal and the frontoparietotemporal areas.[32,79] Jernigan and colleagues noted that the degree of sulcal widening seen in 40- to 60-year-old alcoholic patients resembled that seen in 70- to 90-year-old controls.[84] Ventricular dilation also occurs in alcoholics but is not as common as cortical atrophy and tends to occur predominantly in older alcoholics.[84,86,87] Jernigan and co-workers found a significant correlation between lifetime alcohol consumption and sulcal and ventricular enlargement.[84] Serial computed tomographic scans suggest that cerebral atrophy reverses over time as abstinence continues,[48,88] with more complete recovery of cortical volume in younger than in older alcoholics.[88]

Studies exploring the relationship between cognitive performance and structural brain changes have generally yielded disappointing results. Although several studies of alcoholism have reported significant correlations between intellectual impairment and cerebral atrophy,[89-91] when age and IQ are controlled for, these associations usually diminish or disappear.[86] The relationship between cerebral atrophy and cognitive impairment in alcoholism may be similar to that seen in aging and dementia, where the presence of even severe cerebral atrophy, by itself, is not diagnostic of cognitive impairments.

Neuropsychological Impairments in Alcoholic Women

Most research on cognitive function in recovering alcoholics has used samples of male veterans in inpatient or outpatient alcohol treatment programs. The relative vulnerability of women to cognitive deficits associated with chronic alcohol abuse has received only limited study, with inconsistent results to date. While most studies report the same deficits in alcoholic women as in alcoholic men, such as impairments in abstraction and in visuospatial abilities,[92] some studies have reported gender-related differences.[54] Some studies that compare cognitive functioning of alcoholic women and men show better performance among the women in visuospatial-paired associates[93] and in both verbal and visual short-term memory[92]; however, other studies find additional deficits in women, such as in verbal abstraction ability,[94] or report the same pattern of deficits in women as in men, but with greater severity among women.[95,96] Acker, in a study of 33 female and 72 male alcoholics matched by age, education, and estimated premorbid intelligence, found that women showed cognitive impairments comparable to those of men in pattern and severity, despite shorter drinking histo-

ries and a lower average daily consumption.[95] When drinking histories were equated either by subject-matching or by statistical control, women showed more severe deficits than men in short-term memory for verbal and visual material and in psychomotor speed. Although there are some inconsistencies among these studies, possibly as a function of methodologic or sample differences, it is safe to conclude that female alcoholics, like their male counterparts, are at risk for substantial cognitive deficits.

Alcoholism Duration and Consumption Characteristics

While the duration of alcoholism has been found to have a small positive correlation with the severity of some cognitive impairments, this effect becomes statistically insignificant when the effects of patient age are controlled for.[41,97,98] Variables such as the amount consumed per drinking occasions and the distinction among bout, binge, and daily drinkers have also been evaluated as predictors of the severity of neuropsychological deficits but have been found to explain little cognitive test performance variance.[98,99] These studies suggest that the drinking history and pattern are not of primary importance in mediating the presence or severity of cognitive impairments in abstinent alcoholics.

The prevalence of cognitive deficits in alcoholic patients has led some investigators to the study of the cognitive status of social drinkers. Most studies have examined the relationship between cognitive performance and aspects of drinking practice such as average amount of alcohol consumed per occasion, frequency of drinking occasions, and total alcohol consumed per time period. In a thorough review of this literature, Parsons concludes that, although relationships have occasionally been reported between drinking variables and performance on cognitive-perceptual tests, there are no stable and reproducible results.[100] While heavy alcohol consumption may put persons at risk for cognitive impairments, more research is needed to establish this as a fact. Clearly, the risks are not as high for social drinkers as for persons whose alcohol consumption has been more extensive.

Implications of Cognitive Impairments for Treatment Planning

Tumarkin and associates first proposed that brain damage may be related to a poor prognosis for rehabilitation in alcoholic patients.[101] In support of this hypothesis, higher levels of neuropsychological functioning have been shown to be associated with increased rates of the completion of inpatient treatment[102] and with attendance at outpatient treatment groups.[14] In addition, the neuropsychological status was also found to be a statistically significant predictor of employment success nine months after discharge from treatment.[103-106]

In a discussion of the implications of cognitive impairments for the treatment of alcoholism, McCrady and Smith describe the timing of treatment interventions as often being inappropriate to the capabilities of a cognitively impaired patient.[105] They note that

> [In] the earliest phases of inpatient rehabilitation, patients are asked to learn new information, interact verbally in individual and group therapy, and to make difficult connections between events, actions, and feelings which they have perceived as unconnected (a difficult abstraction task). . . . All of this occurs while verbal deficits, retention deficits, and abstraction/problem-solving are most impaired! We expect all patients to learn and progress through treatment at approximately the same rate, whether or not they are able to do so.[105(p147)]

After discharge from inpatient programs, the patient's tasks become even more complex. He or she must deal with family members, neighbors, co-workers, and occupational issues, all in the context of possible drinking stimuli and situations. Unfortunately, even though problem-solving and abstraction abilities may still be impaired during this period, most treatment plans call for reduced treatment contacts.

Sensitivity to the possibility of cognitive impairments in abstinent alcoholics is essential to informed treatment planning. Patients with deficits in their ability to learn new information are at a disadvantage in intensive treatment programs. They may be erroneously labeled as "unmotivated" or "not ready to stop drinking," rather than as "impaired," and their higher rates of treatment dropout may result from frustration over the inability to function effectively in a program that makes unrealistic cognitive demands. We agree with McCrady and Smith's suggestion that a different approach be taken with the neuropsychologically impaired patient: Early treatment should focus on enforced abstinence and should be primarily supportive, without making major demands on patients to learn new material or to think about their experience in an analytic fashion. As cognitive functioning improves, patients may begin to participate in the more educational and insight-oriented aspects of rehabilitation.

We note that the Alcoholics Anonymous program is appropriate to the cognitive limitations of newly abstinent alcoholic persons. The focus in Alcoholics Anonymous is on maintaining abstinence from alcohol within the context of acceptance and support. New initiates are told to come to as many meetings as possible ("90 meetings in 90 days"), without an expectation that they become fully indoctrinated into the culture of the program ("fake it until you make it"). Indeed, during the initial period, the emphasis is on behavioral change rather than on understanding or a change of attitude.

Because most alcoholics do show some cognitive deficits, at least during early abstinence, it is important for all health care workers involved in treatment to be alert to the possibility of cognitive impairment. Some treatment settings[106] have begun to screen all incoming patients with a brief assessment of some cognitive functions and to use results of this screening as the basis for expectations of the patient's ability to make use of various aspects of the treatment setting. More research is needed into the relationship between cognitive deficits and the ability to profit from different kinds of interventions. In the absence of such knowledge, we recommend minimizing cognitive demands on patients early in abstinence.

Finally, while cognitive status does predict the ability to benefit from early treatment efforts and to maintain employment, intact cognition is not associated with continuing abstinence.[103,104] Thus, while the cognitive status may be highly relevant to the success of early intervention in alcoholism, it may not be predictive of long-term recovery. Therefore, it must be remembered that even those alcoholics with normal cognitive functioning during abstinence nevertheless continue to be at risk for resuming drinking practices.

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